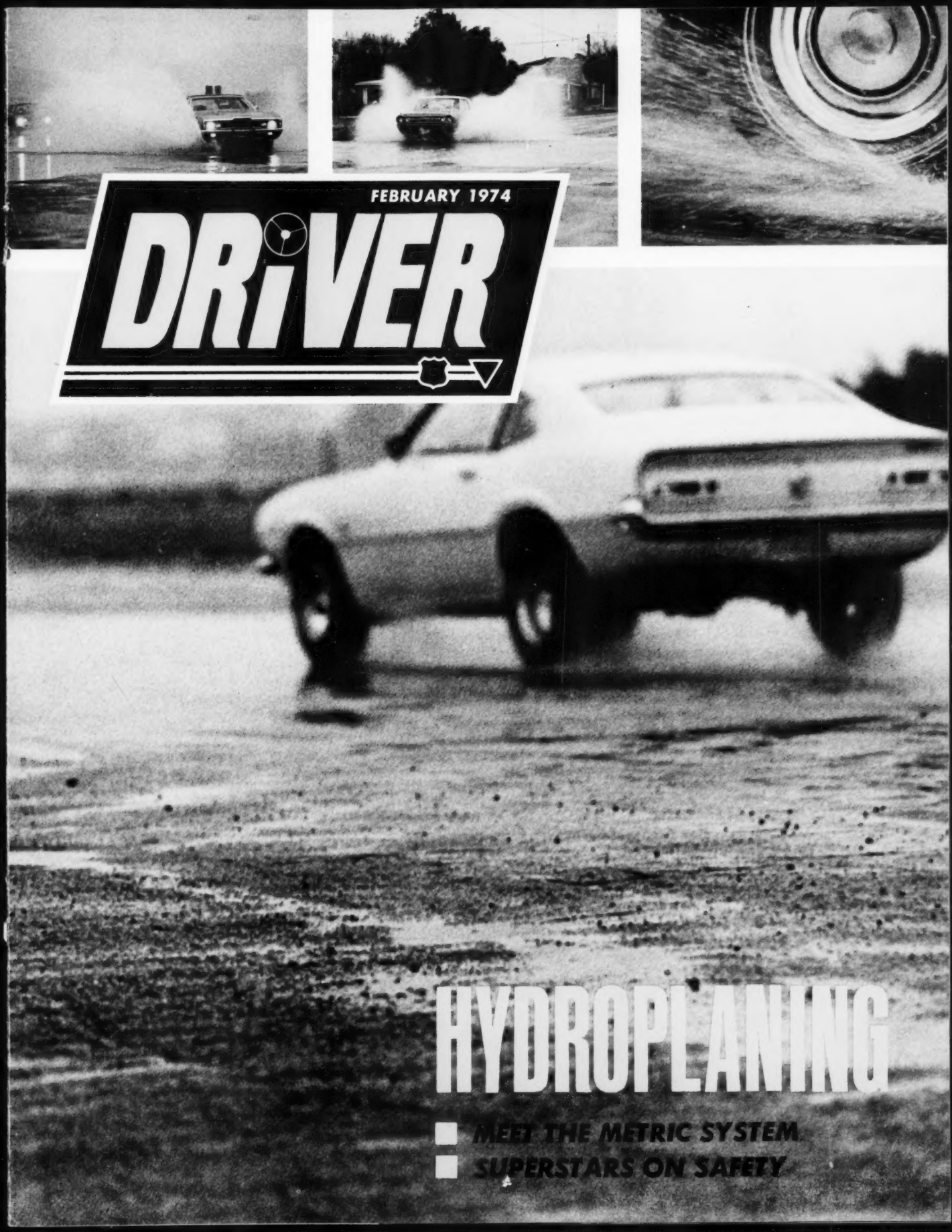

FEBRUARY 1974

DRIVER

HYDROPLANING

MEET THE METRIC SYSTEM

SUPERSTARS ON SAFETY

DRIVER

You're signed up for a professional driving school and the instructor has your class standing out on the course—a grid-like network of paved streets. Three cars are lined up. One has standard tires with good tread, one has slicks, and one is equipped with two slicks and two standard tires.

The instructor asks the class which car will stop in the shortest distance on dry pavement. A couple of students say the car with standard tires, and there's some good-natured laughter when you suggest the one with slicks. The rest of the class is surprised when the instructor agrees with you that the car with slicks will stop much quicker. A demonstration proves the point.

Many people, even some experienced truckers and highway policemen, believe that the tread on tires is for traction on dry pavement. Not so. The tire tread's main job, besides reducing operating temperature to provide long mileage and a few other tasks, is providing traction on *wet* surfaces. If stopping on dry surfaces is the only consideration and you don't care about tread mileage, slicks are great. But slicks or worn treads don't get it on wet surfaces.

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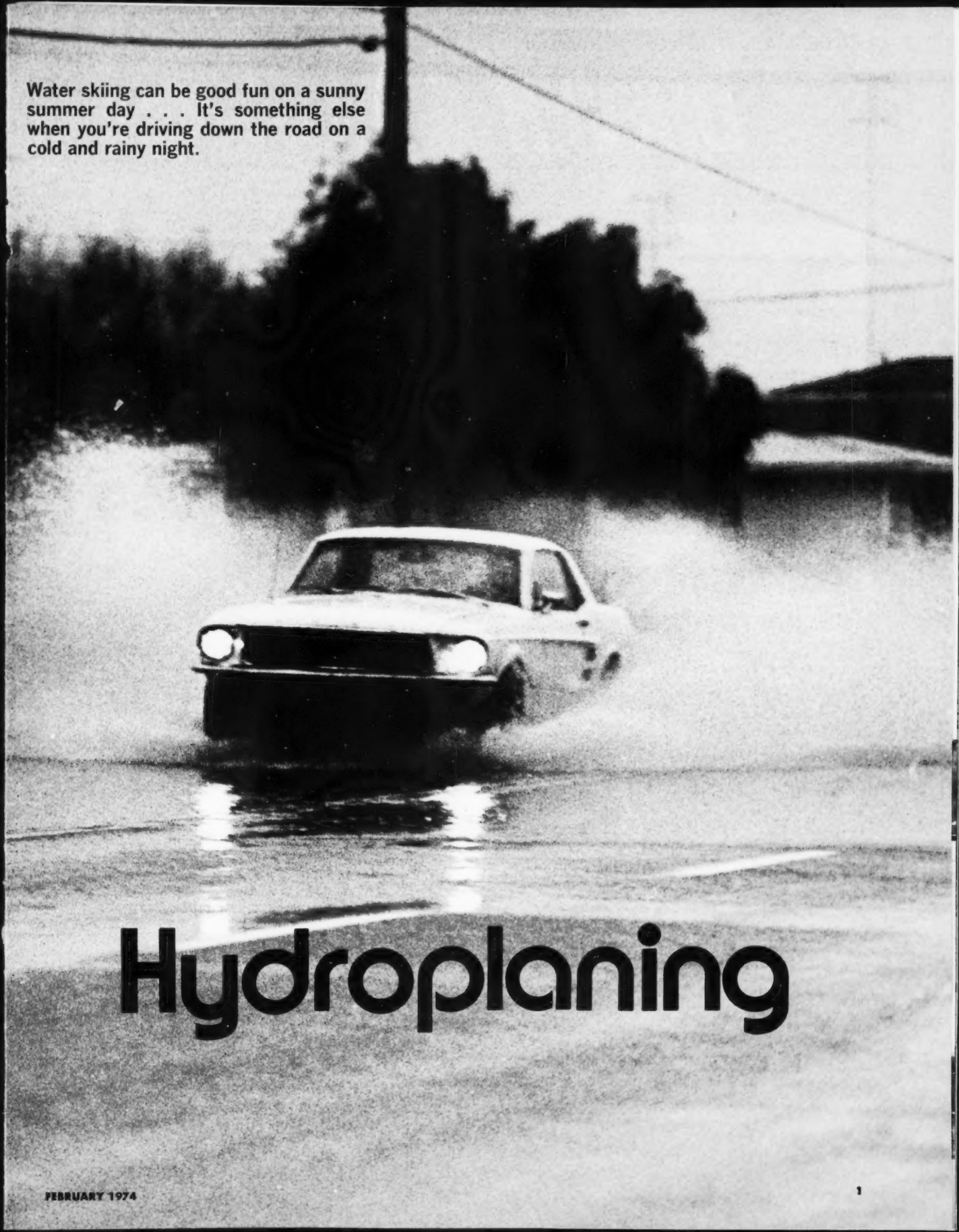

Water skiing can be good fun on a sunny summer day . . . It's something else when you're driving down the road on a cold and rainy night.

Hydroplaning

DRIVER

THE TRAFFIC SAFETY MAGAZINE FOR THE MILITARY DRIVER

FEBRUARY 1974

VOLUME 7 NUMBER 9

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THE EDITOR SPEAKS

DOUBLE CLUTCH

Tougher traffic laws seem to be the name of the game these days, and not just in the United States. Here are some recent developments in Europe:

GERMANY

A new German law reduces the permissable blood alcohol content from 1.3 to 0.8 per thousand units. (The average person reaches 0.8 after four highballs or a half bottle of wine or 48 ounces of beer.) If you're caught driving with a blood alcohol content between 0.8 and 1.29, German authorities may fine you up to DM3,000 and suspend your license for three months. Higher blood alcohol levels can cost DM10,000 or a year in jail or both!

FRANCE

All drivers and front-seat passengers **must** wear safety belts in cars registered in France after April 1970. The French have cut the speed limit on all highways except **autoroutes** to 62 mph and have made new driver licenses provisional for three years after issue. Weekend traffic congestion causes the French so much concern that vehicles transporting heavy loads have been banned from main roads on Sundays and holidays.

ITALY

The Italians have gone a step further than the French and banned all Sunday and holiday driving. The operation of any private motor vehicle on those days is legally prohibited and only public transportation is available. Naturally there aren't enough taxis to go around, so if you are bound for Italy, be sure not to arrive on a Sunday or Italian holiday.

NEXT MONTH

A visit to the Calif. Hwy Patrol Academy

The instructor proves it by calling out the water truck to wet the pavemen. The car with the standard tires brakes to a stop within a reasonable distance on the wet surface, but the slick-equipped car skids almost out of sight.

The reason for this is simple—the slicks float on the water and lose contact with the pavement when the brakes are applied, but treaded tires are able to maintain traction by channeling the water through the tread grooves to maintain the contact between the tire and pavement.

Most people know that hitting the brakes on wet pavement can instantly turn their car into a giant water ski. Also that the balder the tire the better it skis. But unless you have thrilled to an experience known as aquaplaning, or more commonly hydroplaning, you may not know that you can lose control of your car when just cruising down a straight stretch of road.

So with the wet months about to thunder down on us, it's a good idea to learn a bit about the potentially dangerous form of automotive water sport known as hydroplaning.

WHAT IS DYNAMIC HYDROPLANING?

When a car moves along a wet roadway, water penetrates between the tires and the pavement, causing water pressure which can raise a portion of the tire off the pavement. The pressure increases with increased vehicle speed and supports more and more of the tire. At a critical speed (called the hydroplaning speed), the tire is completely supported by the water and is actually floating. When this happens, the driver loses all control until the car slows to below the hydroplaning speed and the tires again make contact with the pavement.

But knowing *what* happens isn't nearly enough. To stay out of trouble on wet roads, you've got to know *when* it can happen.

Hydroplaning occurs when the tire inflation pressure, speed of the car, water depth on the road, condition of the tire tread *are combined in such fashion* that the tire loses contact with the road. Let's consider each of these factors in more detail.

SPEED AND TIRE PRESSURE

Presuming for the moment that enough water is present for hydroplaning, the speed at which a tire will hydroplane may be predicted solely on the basis of tire inflation pressure. Here's why. Because the tire is flexible and deforms under changing loads, the ratio of weight carried by the tire to the area of tire contact on the pavement remains about the same. And this ratio of weight to area will always be very near the tire inflation pressure.

To learn the speed at which the tires on your car are likely to rise above the wet pavement you need the help of a tire gauge and a square root table. Simply find the square root of the tire pressure figure and multiply this square root by 10.35. For example, given 36 psi, we have the following: 10.35 x V36 = 10.35 x 6 = 62.1 mph. Using the same method of computation, a tire pressure of 16 psi gives a hydroplaning speed of 41.4 mph; 24 psi, 50.7 mph; 32 psi, 58.5 mph.

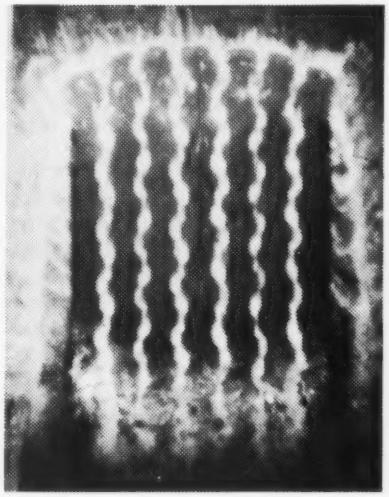
continued

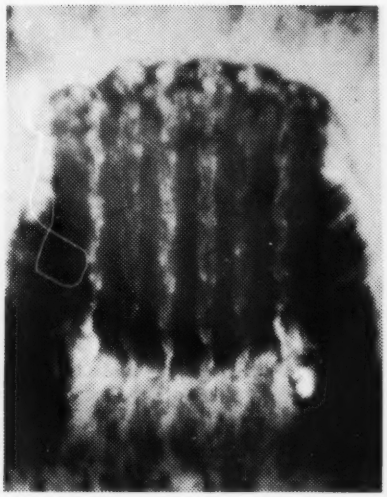
Below hydroplaning speeds, a deep puddle acts as an effective brake. Hitting such a puddle with only one side of car can cause car to swap ends.

The above speeds are examples of those at which total hydroplaning occurs—with total loss of the traction needed for steering and braking. But some loss of traction, due to partial support of the tires by water, may occur well below hydroplaning speeds. This "partial hydroplaning" is the more common happening and is every bit as dangerous as the total variety.

WATER DEPTH, ROAD SURFACE, AND TIRES

What about the other factors? As we already mentioned, the equation used above presumes there's enough water present for tires to start acting like water skis. The actual water depth needed in a particular situation depends upon the size and number of channels present to allow the escape of water from beneath the tire and delay build-up of water pressure. These "escape channels" may be provided by the pavement surface (through unevenness or grooves) or by good tires. The bit about the pavement surface is simple enough, but what are "good" tires? Here's how you can rate your car's tires. (Maximum number of points is three.)





These Tire Industry Safety Council photos show why a worn tire is more dangerous on wet roads. A new tire, at left, funnels out the water through its grooves, leaving the rubber in contact with the surface. Worn tire, at right, with only 1/16-inch of tread remaining and shallow grooves, is virtually skimming over a film of water—in other words hydroplaning. (Photos shot at 1/9000th of a second as car passed over a glass plate at 50 mph.)

When the rain first begins, the problem is **viscous** hydroplaning—the water combines with dirt, dust, oil and grease to form a slick paste over the pavement. If you're driving on bald tires, your chances of losing control under such conditions are 20 times as great as with good tread.

Give your tires "one" if they have nice, deep grooves. Tires with deep grooves fare pretty well on wet roads. But even these tires will hydroplane at the predicted speeds when the water depth exceeds the groove depth.

Add another "one" if your tires have an open (wide groove) tread design that provides quick escape routes for the bulk of the water that builds up immediately ahead of the rolling tire.

Now we're getting closer to our "good" tire.

Jot down another "one" if you're using radial or belted bias-ply tires. Thanks to stiffer tread belts, these

tires permit little distortion of the tread area while the tire turns. Consequently, the grooves stay open to allow the water to pass through them.

Now you should have a pretty good idea of what constitutes a "good" wet-road tire. If your tires deserve the maximum rating of "three," you shouldn't have too many problems—if you slow to a reasonable speed and don't run into too much water.

The lower the rating, the slower and more cautiously you'll have to drive your car when the sky opens up. Of course, badly worn tires don't perform well under any conditions. Since smooth or badly worn tires will hydroplane when there is less than .04 inch of water on a smooth surface, we wouldn't be exaggerating too much if we said drivers using such tires are in danger if some inconsiderate person up ahead spits on the pavement.

A word of caution if you are driving "low-profile" tires. There are a lot of good reasons for the recent trend toward these tires. Essentially, a lower, wider tire lowers the car's center of gravity and puts more rubber on the road for safer, surer handling under nearly all conditions. But remember that more rubber on a wet road can mean the tire will more readily get up on top of the water—the "water ski" is bigger. So if you're using these tires, pump them up to maximum recommended inflation to increase the hydroplaning speed, and slow down on wet roads.

VISCOUS HYDROPLANING

Until now, we've been discussing dynamic hydroplaning, a major problem on the highways. But what about

continued

Grooves in the pavement guide tires around curves, help prevent ordinary skidding. They also provide escape channels for water and so delay hydroplaning problems.

all those unfortunate drivers who stack up their cars on wet city streets? The cause is still hydroplaning, but this time it's *viscous* hydroplaning—or, if you prefer, viscous skidding.

Consider a road untouched by rain for many months. The first few drops of water combine with the already present dirt, dust, oil and grease to form a gooey paste slicker than the proverbial greased pig. Extended rains will wash much of the muck off the pavement; but, during the beginning of the shower, watch out! Also, bear in mind that even after the goop has been washed away, wet pavement is slicker than dry pavement and wet rubber provides less traction than dry rubber.

Remember this: viscous hydroplaning is much more common than dynamic hydroplaning, and it can occur *without* rain. A little dew from the damp night air acts as a very effective substitute. Think about this next time you're out in the wee hours.

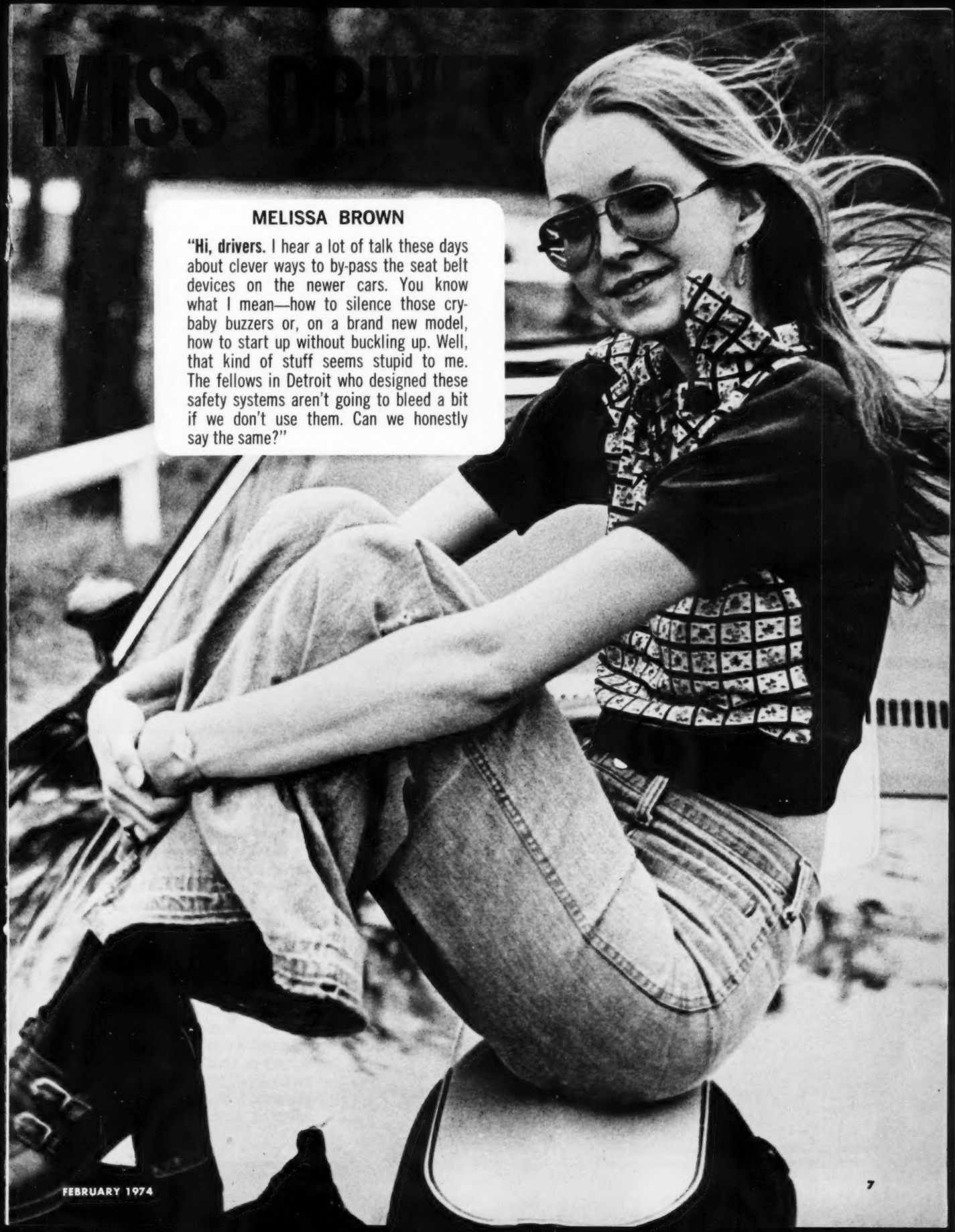
AVOIDING HYDROPLANING

Here are a few ways to avoid "auto" skiing:

- Throw out the anchor when the roads are wet. This is especially important when conditions are ripe for viscous hydroplaning. Just how much you should slow down is something you'll have to decide based on the variables we've been discussing.
- Watch for standing water or puddles—especially on curves. When you can see patches of water or the water is deep enough to cover pavement uneveness, assume there is enough H_2O for hydroplaning.
- Corner carefully and don't make any abrupt movements of the steering wheel. Be a smooth driver.
- Be alert for "loose" steering (more difficult to detect with power steering which reduces the driver's ability to "feel" the road). If the steering wheel begins to feel loose, your tires are starting to hydroplane. Best bet then is to gradually get off the accelerator and stay away from the brakes. Braking during partial or total hydroplaning makes things worse quickly.
- Increase tire pressures for wet-road driving. For every additional psi, minimum hydroplaning speed is increased by roughly one mph. But don't go over the recommended maximum pressures.
- Know the condition/design of your tires and drive accordingly.
- Follow in the tracks of the car ahead of you. Its tires are clearing away the water.
- Stay alert for cross-winds and uncrowned roads.
- Increase the gap between your car and those ahead to give yourself more time and distance to stop or control your car.
- Test the brake action occasionally to check traction on different surfaces and under different conditions.
- Try to match up your tires so that those with similar tread groove depth are on the same axle. If you're going to hydroplane, you may as well do it straight ahead.

When the rain shower passes, it can leave trouble behind. Leaves, mud, and slippery muck washed onto roadway can mean loss of traction.

MISS DRIVE



MELISSA BROWN

"Hi, drivers. I hear a lot of talk these days about clever ways to by-pass the seat belt devices on the newer cars. You know what I mean—how to silence those cry-baby buzzers or, on a brand new model, how to start up without buckling up. Well, that kind of stuff seems stupid to me. The fellows in Detroit who designed these safety systems aren't going to bleed a bit if we don't use them. Can we honestly say the same?"

We Americans think of ourselves as hard-headed, practical people whose scientific know-how has set a standard for the world. So how come we're the only major industrial nation that still measures things in terms of dry barleycorns laid end to end (inches) or British wine bottles (gallons)?

Not that we haven't been thinking about going to a better system. In fact, we've been thinking about it for over 150 years. John Quincy Adams delivered a report to Congress on the subject in 1821. He thought the new metric system was ideal but that it might be a little soon for the U.S. to adopt it since we were doing our

AN INTRODUCTION TO THE METRIC SYSTEM

major trade with England and they were using the inch-pound system.

Hindsight being so perfect, we know now that we should have moved to the meter when Mr. Adams first brought the subject up. The change-over would have been much simpler and far cheaper than it will be now. But we stuck with pounds and ounces; feet, yards and inches; gallons, quarts and pints, while the rest of the world gradually settled on metric standards. Today we find the only countries with whom we maintain a common measurement system are Burma, Ghana, Liberia, Trinidad and Sierra Leone.

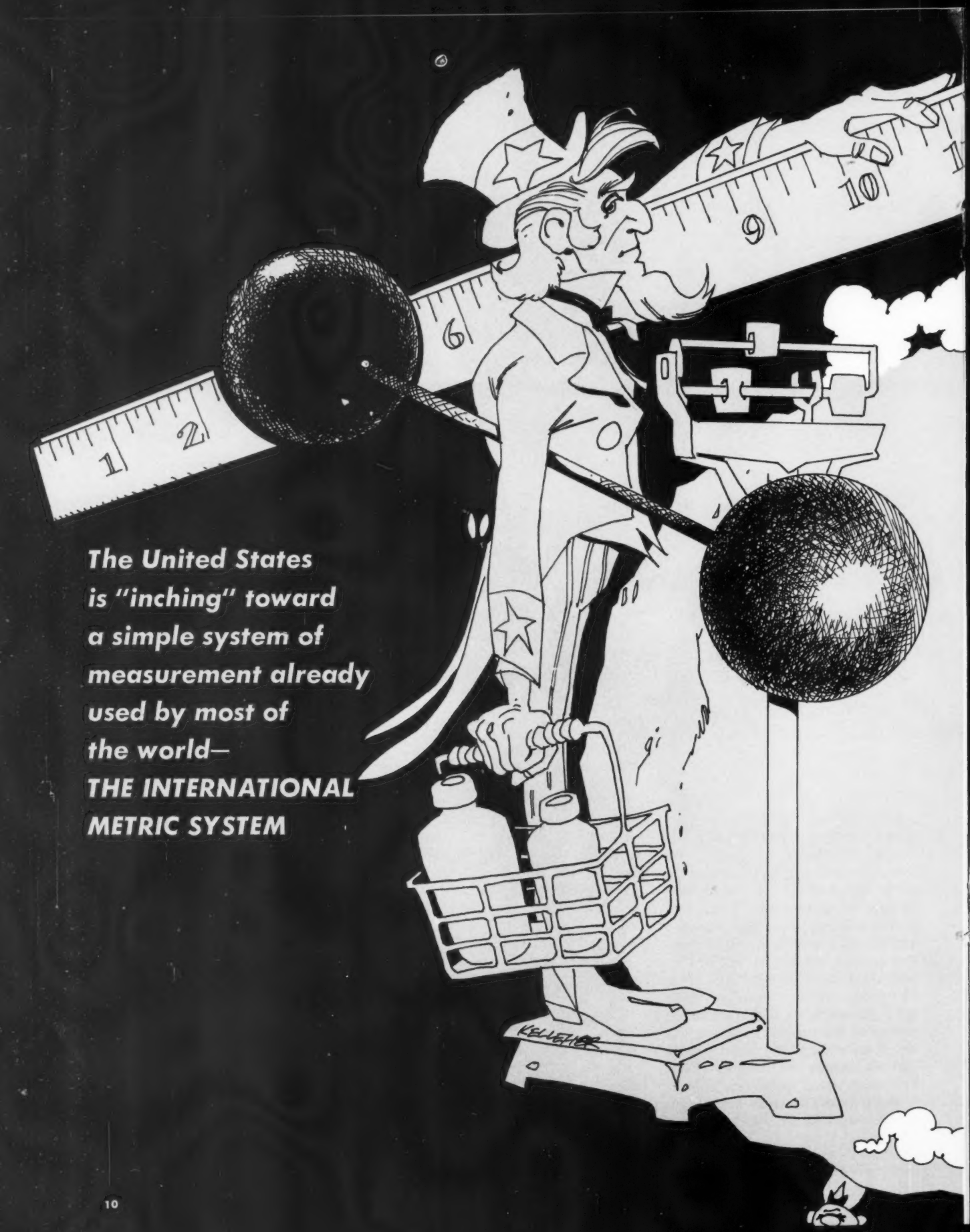
But it looks like we are about ready to catch up with the world. A Bill to make the metric system the official standard within 10 years has been considered several times by Congress and there is little doubt that legislation is on the way. (The House Science and Astronautics Committee has passed such a bill in the current session and it is now in the Rules Committee awaiting action.)

WHAT IS THE METRIC SYSTEM?

The metric system is based on the *meter,* a tiny fraction of the earth's circumference. The meter was intend-

continued

(right)
The United States is the only major industrial country using a non-metric system.



The United States is "inching" toward a simple system of measurement already used by most of the world— THE INTERNATIONAL METRIC SYSTEM

SI BASE UNITS

Quantity	Name of unit	Unit symbol	Quantity	Name of unit	Unit symbol
length	meter	m	electric current	ampere	A
mass	kilogram	kg	thermodynamic temperature	kelvin	K
time	second	s	luminous intensity	candela	cd

There are six base units to cover measurement. These are used by almost 90% of the world's population. Three of the units will solve 75% of all measurement problems.

ed to be 1/10,000,000th of the distance measured on the earth's surface from the equator to the pole. Since even very careful surveying leaves the accuracy of this measurement in some doubt, the meter is legally defined as the length of a certain platinum bar kept in Paris.

Other elements of the metric system are based on the meter, and all larger and smaller measures of a given unit are decimal ratios of it. In other words, it's based on 10s just as our money is. With metric units, it is not necessary to multiply by 12 to change feet to inches, or divide by 3 to change yards to feet, because the units are all related systematically.

The metric system was developed in France during the French Revolution and the French made it compulsory in their country in 1840. By 1960 most of the world was using the system, but there were slight differences in some of their measurements. So that year an international conference was held to standardize all units of measurement. The Conference adopted the *Systeme International d'Unites*, and that is why you will often hear the system called the SI

WHY IS METRIC BETTER?

The best thing about the metric basis of weights and measures is its simplicity. It was designed to fill the needs of scientists and technicians, and the average person needs to know only a few simple parts of it.

There are just six base units in the International Metric System.

- Length is measured in *meters*.
- Time is expressed in *seconds*.
- The unit of mass is the *kilogram*.
- The unit of temperature is the *Kelvin* or *Celsius*.
- Luminous intensity is expressed in *candela*.
- The unit of electric current is the *ampere*.

Every other unit in the system is derived from these six basics.

If you are mathematically inclined, you may feel it is easier to do simple arithmetic with the Customary System

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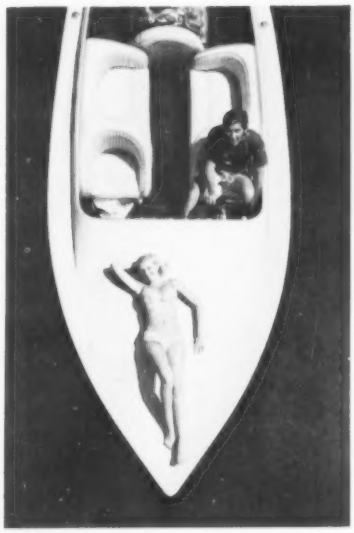


30 DEGREES CELSIUS

30 DEGREES FAHRENHEIT

There's a big difference between readings on a metric thermometer and those on a Fahrenheit thermometer. When using metric temperature, water freezes at 0° and boils at 100°. (Celsius is same as centigrade; for all practical purposes, the Kelvin or absolute scale is the same as the centigrade but Kelvin is related to the temperature of gases and the numerical readings for freezing and boiling of water are different from the centigrade).

UNIT	LENGTH	MASS	VOLUME
Metric	meter	kilogram	liter
Customary	inch foot yard fathom rod mile	ounce pound ton grain dram	fluid ounce teaspoon tablespoon cup pint quart gallon barrel peck bushel

The complexity of the Customary System (American) as compared with the Metric is readily apparent in this chart.

continued

AN INTRODUCTION TO THE METRIC SYSTEM

because both the duodecimal and binary bases are handier. The duodecimal (base 12) has more factors than the decimal (base 10), and binary (base 2) is the natural arithmetic for making yes-no choices or designing computers.

Actually, it is easier to compute with metric units. In most cases, only the addition of a zero or the moving of a decimal point is necessary. And the relationships between the six basic units are simple. You don't have to remember how many cubic inches there are in a gallon or whether an ounce is fluid or avoirdupois.

Children learn the metric system easily because it is based on a fundamental relationship to their anatomy —10 fingers, a measurement system based on 10.

IS IT WORTH THE TROUBLE TO CHANGE?

But why are we going to bother to change over? After all, we're used to our own system and we haven't done so badly with it.

Well, the pressure is on from American business. When the U.S. was the leading producer of goods and materials, our consumers in other countries just had to learn to use our weights and measures. Now that Japan, Germany, France and Canada are all metric, the products they manufacture are interchangeable throughout the world, and this helps tip the balance of trade in their favor.

"The U.S. is jeopardizing its world leadership in science and handicapping itself with respect to balance of trade by not adopting the metric system immediately," says Dr. Glen Alliger of Firestone. "The problem of changing over to the metric system is substantially outweighed by the advantages of the change."

HOW WILL IT AFFECT US?

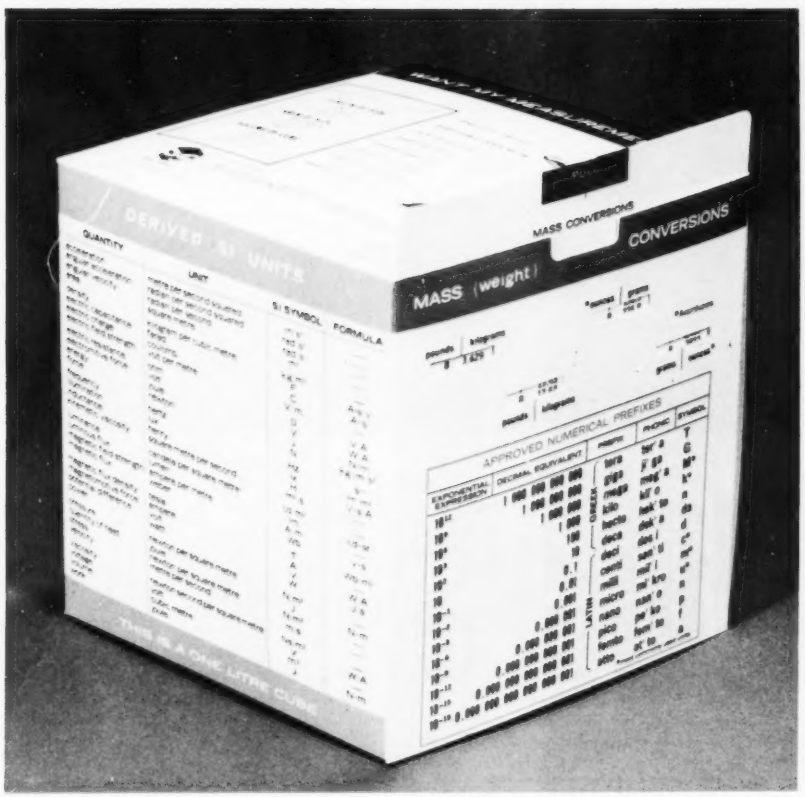
Stop to think about it and you'll remember that you've already bought and used products measured in metric units. Photographic film, lenses for cameras, skis, station selectors on radios. Some tires sold in the U.S. have metric size markings.

But it is almost impossible to realize the extent to which our everyday thought and speech will change when we have converted to the metric. We'll be buying kilograms of hamburger and liters of gasoline. Asking for a 15-millimeter socket wrench and ad-

(right)
An example of how the metric system works compared with the Customary. Metric eliminates hundreds of unrelated units of measure.

To convert METRIC units, just shift the decimal points.	To convert U.S. units you must multiply or divide.
181 centimeters = 18.1 decimeters = 1.81 meters.	181 inches = 12 | 181 (15 1/12 ft; 12; 61; 60; 1) = 36 | 181 (5 1/36 yds; 180; 1)
To find cost using METRIC units . . .	**To find cost using U.S. units . . .**
	1 U.S. ton costs $180,000.00
1 metric ton (1000 kg) . . . costs $180,000.00	1 pound costs . . . 2000 | 180 000.00 ($ 90.00; 180 000)
1 kilogram costs . . . $180.00	1 ounce costs . . . 16 | 90.00 ($ 5.62; 80; 100; 96; 40; 32; 8)
1 gram costs . . . 18¢	

(below)
Many devices are available to help you convert the Customary System to the Metric. This is the Metricube. Two built-in working calculators convert weights and lengths rapidly. The Metricube is on display at the Museum of Science and Industry in Chicago. **(From Polymetric Services Co.)**



miring a Miss DRIVER whose measurements are 91-61-91.

The biggest problem will be for people who work with units of measure. As Jack Gieck of Firestone says, "I think the real difficulty will be reprogramming men's minds, particularly middle-aged engineers who think in English units. The tough part will occur in trying to think about problems in mechanics—like the cornering forces on a tire, the ride frequency of an air suspension system, or the energy absorbed by our pneumatic bumper."

HOW LONG WILL IT TAKE?

People disagree about how long it will take us to make the change to the metric system. Great Britain started its changeover in 1965 and reports excellent progress in sticking to its 10-year timetable.

The pharmaceutical industry in the U.S. changed to the metric system about 15 years ago at about half the cost they anticipated and completed the job in about two years.

Other industries present different problems. Ford has plunged into the Metric System with their new 2.3 Liter, 4-cylinder engine that is the standard powerplant on the 1974 Mustang II. But John Benedict, Chrysler's metric expert, thinks the complete change-over for the auto industry may take as much as 40 or 50 years. His concern is well-founded, because Detroit must deal not only with designing and building new metric cars and parts, but also with supplying non-metric parts for more than 100 million cars already on the road. One automaker currently lists more than 300,000 parts numbers in its current catalog. Sheer numbers complicate the job.

Regardless of how long it takes, the changeover will be a gradual one. First it will involve our software—we will be using conversion charts. But then, as we acquire new measuring cups and tools and automobiles, we will make hardware changes. And this is essentially the way the entire national transition will be accomplished—through a gradual, practical, economical changeover.

(This article is based on information from Firestone, Oldsmobile, National Bureau of Standards, and Polymetric Services Co.)

DENNIS HULME

MARIO ANDRETTI

RICHARD PETTY

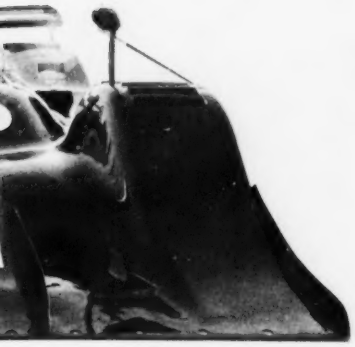
JACKIE STEWART

Superstars on S

GEORGE FOLLMER

DAVID PEARSON

PETER REVSON



Safety

by
Lt LARRY RANDLETT

Real-life racing drivers, unlike their fictional counterparts in books and movies, are not foolhardy individuals out to satisfy some subconscious death wish by competing against one another at 200 mph in delicate machinery. On the contrary, they are intelligent men who approach driving in a professional manner. They cannot take their trade lightly.

Trans-Am driver Lee Midgely probably put it best when he said, "Auto racing is a sport. I'm not out there to take unnecessary risks with my life. I'm sure of my equipment before the engine is even started. The fuel lines, seat-belt mountings, brakes, roll bar, suspension mounting points and steering are meticulously inspected. And I inspect myself to make sure I'm mentally and physically prepared for competition. A driver who is not ready for any situation is not a professional and he isn't safe."

With men who race for a living, concern about safety isn't limited to the track. They believe that safety on the highway is just as important.

Recently, DRIVER had an opportunity to hear a number of top racing drivers talk about the subject. Each driver has his own approach, but all are concerned. We hope you enjoy reading what these experts say.

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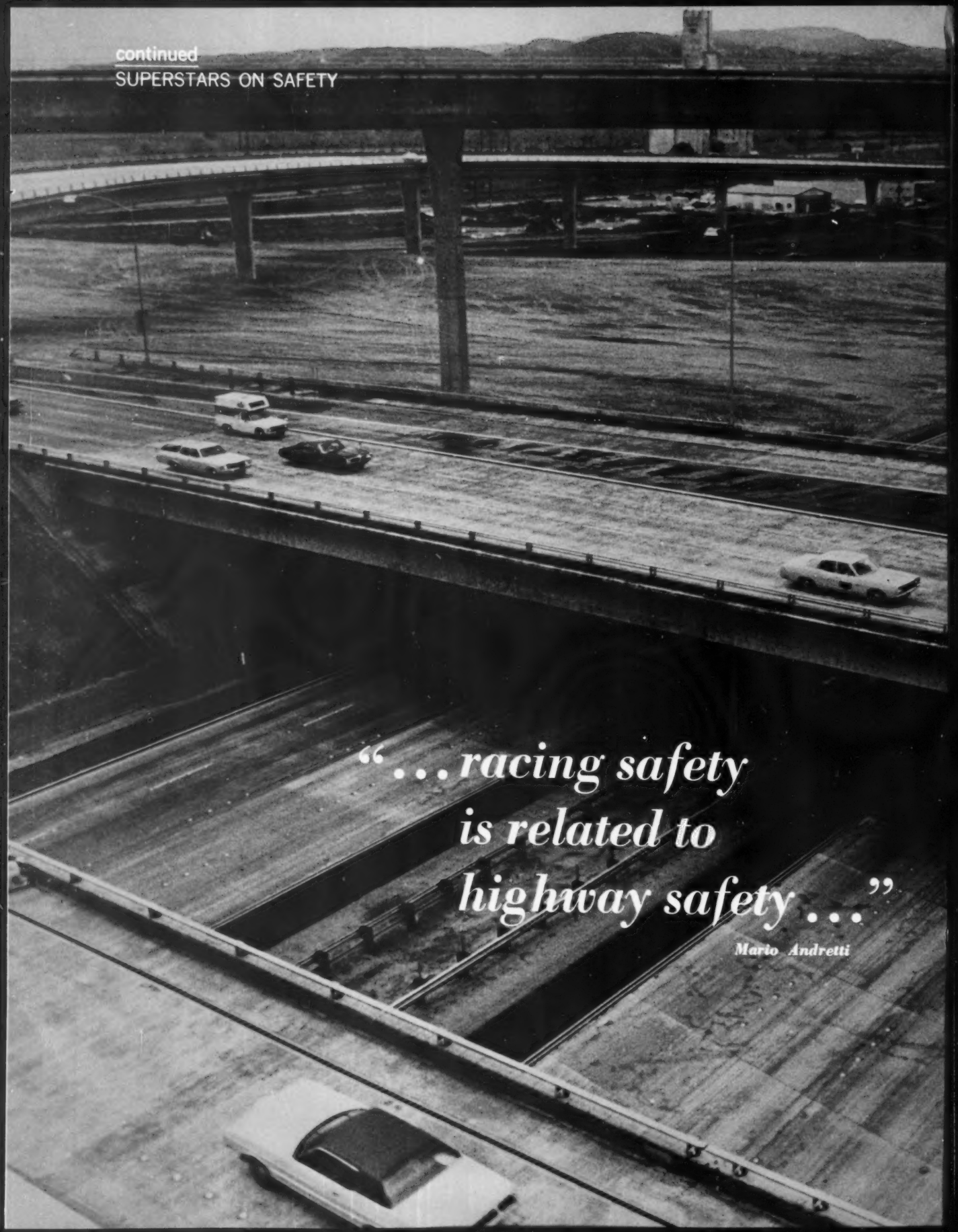


"...racing safety is related to highway safety..."

Mario Andretti

MARIO ANDRETTI

INDIANAPOLIS "500" WINNER

"Remember, you don't know anything about those people on the road with you."

Though some people don't think so, safety is of the utmost importance in the business of automobile racing. At the speeds we are traveling and as close as we are racing to one another, we have to think about safety all the time if we're going to survive. We go to all lengths possible to protect ourselves in the cockpit. We use the proper belts, lap straps, and shoulder straps. These might be considered a nuisance in a passenger car but they provide a lot of protection in a collision. The point I'm making is that racing safety is related to highway safety.

In both automobile racing and highway driving, we're faced with the same hazards. But I think highway driving represents a greater danger because of the unknown factors. Every day you are virtually rubbing fenders with thousands of motorists of unknown emotional states, different ages and different skills. If you stop to think about it, you'll start driving defensively. That's the key word, **"defensive,"** because you don't know who's on the road with you.

The younger set identifies with racing and I don't think there's anything wrong with that. But if you're going to use a high-performance car, it should be only on a track. Never try to race someone on the highway.

Cars would be a lot safer if people followed the factory-recommended maintenance. If anyone really takes the pains to follow 85% of the suggested maintenance, he will have a pretty safe car.

DENNIS HULME

WORLD CHAMPION—CAN-AM CHAMPION

"Fine people heavily for not using seat belts."

Americans are coming up with a lot of ideas about safety, but it's too soon to know which ones will have a real influence on the accident rates. And sometimes safety legislation has peculiar side effects. For instance, the largest Rolls Royce isn't allowed in the U.S., even though it's the only car I know of that you can virtually drive through a brick wall and come out unscathed. Unfortunately, it doesn't meet American safety standards in other ways.

I would say that BMW and Mercedes haven taken the right approach. They build a good-handling car with a collapsible front end. The Europeans realize that a safe car needs better brakes, better handling and better tires.

Seat belts will save a lot of lives. But I think the easiest way to get people to wear them isn't with an interlock system. People should be fined—a very steep fine—for failure to use belts. And put really good seat belts in the car. They should be like the Air Force uses; a full harness.

Driver education is a very important part of highway safety. Not just academic training but skill development. One thing I have learned from racing is an awareness of what's happening around me. I am super alert to what is happening, not just with the car in front of me but two or three hundred yards ahead of me. If you wait for the brake lights in front of you, you're history. I know it's difficult but you have to think 100% about your driving all the time.

JACKIE STEWART

WORLD CHAMPION

"Your mind should work at 60 mph too."

The whole business of driving safety is very complex. I think the motor industry has done a very good job of improving cars, and highways are getting better all the time. But the single most important factor of all, the human element, is not improving. In fact, the haphazard way we go about driver education is, to me, irresponsible. I think driver education is the key to safety and if we had compulsory driver education we would see the benefits in a very short time.

Now when I drive a car, whether on the road or on the race track, I have to be very smooth and very gentle with it. No driver is helping himself when he's all arms and elbows, driving into roundabouts and steep corners with brakes squealing and tires smoking. This isn't the way to go motoring.

The way to go is smoothly, braking gently and being in the right gear at the right time. All of this is anticipating and understanding and, as I say, having sympathy for your car.

Now, if we could teach people to do this, I think this would be a good step towards safety. The fastest way and the safest way is also the smoothest way and the quietest way. On a race track, as you watch the top racing drivers of the world you see that the guys going cleanly and smoothly are the ones going fast.

A comfortable ride for passengers is the sign of a good driver.

continued

PETER REVSON
CAN-AM CHAMPION

"We need stiffer licensing systems, for both drivers and cars."

There's one big difference between driving in a race and driving on the street—I can control safety factors on the track far better than I can control them on the street. I know the capabilities of the other drivers when I'm racing, and I know the condition of the road and my car.

While most drivers today are pretty good, I see a need for a stiffer licensing system for both drivers and cars. There is a lot of unsafe modifying being done. Many people seem to think their car goes faster if the nose points down hill, but actually that just makes for poor handling.

You still see a lot of guys on the street with racing tires on their street cars. If it rains they can become lethal.

DAVID PEARSON
GRAND NATIONAL STOCK CAR CHAMPION

"Always prepare for the unexpected."

Safety is the hardest thing in the world to talk about. Everybody has their own idea.

When I drive a race car I never worry about myself, but I do watch the other guy because I **don't** know what he's going to do. The same thing is true about driving on the road. I always leave myself an out and am prepared for the unexpected. If everyone watched out for the other fellow, our highways would be a lot safer.

A lot of guys see our cars on the track and try to make their cars similar by raising the rear end. But that's probably the worst thing to do because it ruins a car's handling. The only reason we run high rear ends is because at speeds over 160 mph the car actually lowers as a result of air pressure pushing down the rear and lifting the front. In other words, the car actually runs level at these high speeds. On the highway you can't safely get around a corner if the rear end has been raised. The manufacturer delivers a car properly set up and it should be left that way.

GEORGE FOLLMER
CAN-AM CHAMPION

"The way to go is smoothly, braking gently, being in the right gear at the right time."

The main problem is driver training, apprising drivers of the problems involved in good driving and teaching concepts like "rate of closure." People do most of their driving on city streets and then when they get on the freeway at higher speeds they have no real knowledge of how the car will perform. Things happen a lot quicker at highway speeds and it takes a lot longer to stop, but drivers don't always understand that.

Everybody faces dangerous situations sometime while they are driving. How they survive is somewhat dependent upon luck but mostly upon instinctive reactions. Correct reactions must be developed through practice.

JACKIE STEWART (cont.)

When I drive on the street, I do the same thing I do on the track. I look for an out. It's the unexpected that will get you. If the guy in the next lane loses control he's going to take you with him unless you leave yourself an out.

The whole answer to this safety problem is education. You start in the classroom and use driver simulators to throw situations at students. Get minds alert. My mind works at 120 mph because I've been trained, but the average driver's mind doesn't work at 60 mph.

Another problem is that a lot of guys make unsafe modifications to their cars. Hi-jackers are a good example; raising the rear end of a car not only makes the car's handling unpredictable, but it puts additional loads on various components. Super-wide wheels are another example. These also overload suspension components.

I always use my seat belt and shoulder harness. Anything to keep you from flying forward and hitting the dash or being thrown from the car. You don't have to be hit very hard to be thrown from behind the wheel of a car. But the harness keeps you in control.

RICHARD PETTY

GRAND NATIONAL STOCK CAR CHAMPION

"If we did away with insurance and made everyone responsible for his own car, people's attitudes would change."

When I drive on the race track I know the boys are all professional drivers and they are all going in the same direction. Most of us have driven with each other and we all know how to react to emergencies and we know how the competition will react. But when you're driving on the road you get so many different people with different things on their minds; nobody is really concentrating on driving like we do when we're racing.

I'm just as much at fault as anyone else on the highway, but that doesn't make it right. I don't think anybody pays as much attention to driving as he should.

Everybody takes driving and cars too much for granted. They really don't realize what damage they can do or what little it would take for them to be good and courteous drivers and to eliminate a lot of accidents. I don't know what it's going to take to wake the people up. The government's working for safe cars but when they make safer cars, people just seem to crash them faster. You really don't accomplish anything. The problem is the driver.

My idea has always been to do away with insurance and make everyone responisble for his own car. Then you'd see a big difference in people's attitudes towards their driving. I think a lot of people pay their insurance and go tearing off down the road knowing if they have an accident their insurance will pay for it. But you take the cost of that accident out of next week's pay check and they're going to think twice before taking any chances.

I have to admit that I don't always have the right attitude when I'm driving. I'm busy talking business or listening to the radio or smoking and I'm not really conscious of my driving. I don't check my mirror or car gauges frequently, and I'm not always courteous to other people. This is dangerous.

But I do always use the safety devices provided in my car; seat belts and the like, and I don't modify my street cars either. Many people who do really don't understand physical laws. The car was built to run at a certain height, spring-wise, steering geometry-wise, and for weight transfer in the corners. Anytime you block the car up or lower the car you are going against how the car was actually designed to maneuver. It's not a safe practice.

If I were in charge of auto safety in the U.S., the first thing I'd do is have a big ol' driving school and really teach people how to drive. There are too many folks running up and down the road who don't understand the principles of driving, and when they get into trouble they don't know what to do so things get worse.

SHOCK

"Discover the shocking difference!" If you've replaced the shocks on your car recently you know this slogan for a popular brand shock absorber is right-on. Most people are amazed at how well their car rides and handles after installing new shocks. Since shocks wear gradually (Fig. 1), you just kind of adjust with the shocks and forget how the car should handle.

But besides handling, there are a bunch of other reasons for keeping good shocks on your car. One of the most "shocking differences" is in tire mileage, as your Tech Editor discovered a few years ago. I knew my car's front shocks were bad, but didn't know the front tires would be shot in 10,000 miles. They were. After a set of discount store heavy-duty shocks was installed, a new set of the very same tires rolled 27,000 miles.

In addition to improving handling and tire mileage, good shocks cut fuel consumption by decreasing the tire roll resistance. They also reduce suspension wear by lessening front-end strain. Finally, good shocks just make driving more fun and safer by smoothing out rough roads and keeping the wheels from bouncing off the road on sizeable bumps.

HOW TO TELL

So, good shocks are the right idea —but how do you tell when your old shocks have had it? Jump up and down on the bumper a few times—right? Well, not really. Today's shock absorbers are designed to provide ride control when the car is traveling at

ABSORBERS

The shocking difference

relatively high speeds. So, while hopping on the bumper may provide some exercise for you, it really doesn't tell you much about your car's shocks, unless they're really bad.

You can tell if shocks are shot by looking for fluid on the outside of the shocks. Leaking shocks are past due for replacement. Also, if your car has 15,000 miles or better on a set of shocks, drifts in corners, and bounces on rough roads, you're ready for new shocks. Original equipment shocks are usually gone before 20,000 miles.

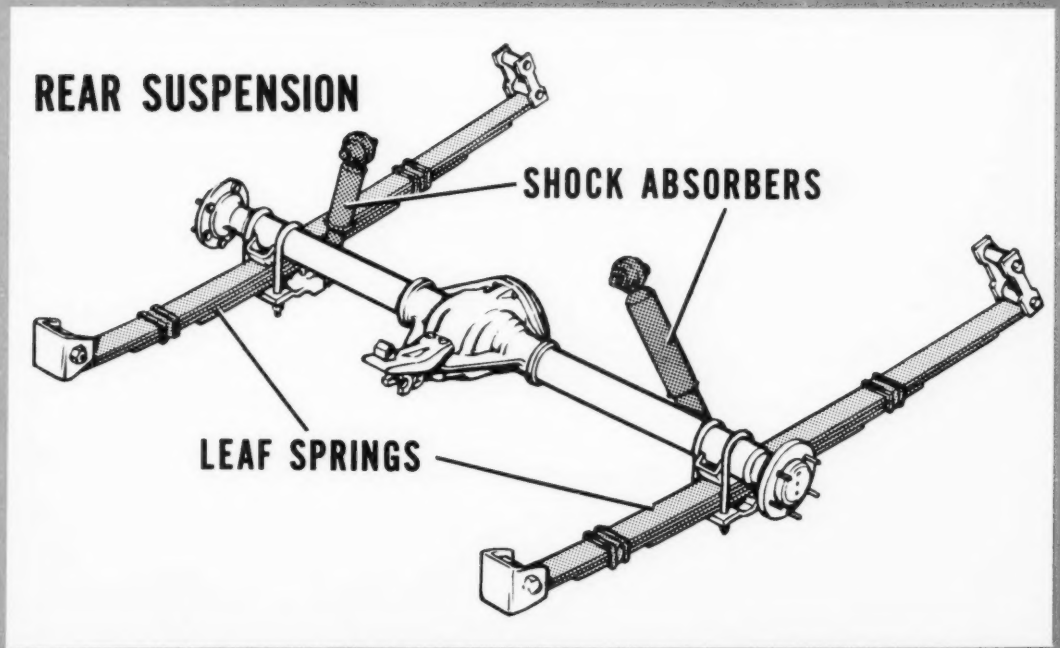
A good double-check if you think the shocks are worn is to drive down a smooth road at about 10 mph and repeatedly tap the brake pedal. If the car starts pitching from front to rear, the shocks have had it. Although shocks wear at different rates, it's best to replace shocks in complete sets to maintain proper handling performance.*

WHAT AND WHERE

If you decide shocks are needed, the first step is determining what type shocks you need and where you want to get them. Most discount and department stores offer good quality shocks of all types and sizes at reasonable prices. Plus, these service centers frequently have shock specials with installation included in the re-

continued

** Many import cars, including some model VWs, have strut front ends that do not use conventional shock absorbers. These units are usually rebuilt when they lose shock damping.*



duced price, or for a nominal additional charge.

So, if you catch a good sale it may be just as easy to drop your car off at a department store service center and have them do the shock job while you shop or relax. However, if you're ordering shocks from a mail order supply or buying from a parts house, you'll want to save the $10-plus installation charge by bolting on the shocks yourself—especially since installing shocks is usually a simple job that can be done in a short time.

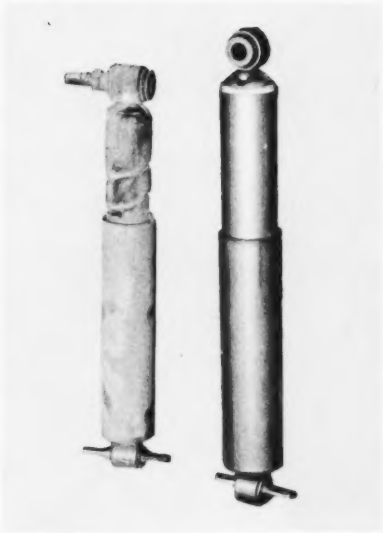
SHOCK TYPES

Whether you have the shocks installed or do the job yourself, the important thing is to get shocks which fit your driving needs and budgetary requirements. There are basically five types and price ranges of shocks available for the average car—all the way from standard replacement shocks to special adjustable high-performance units.

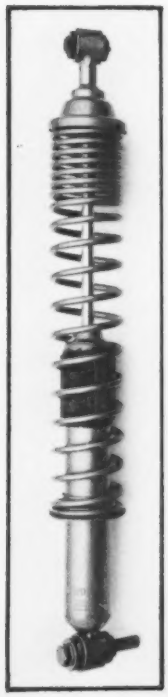
Standard replacement shocks are naturally the least expensive. But even for the average car, it's best to replace original equipment shocks with the heavy-duty type. The heavier-duty models are only slightly more expensive than standard shocks, but they offer a better ride, better handling, and better tire mileage. They are usually guaranteed for the life of the car, and they also help compensate for worn springs and the worn suspension systems in older vehicles.

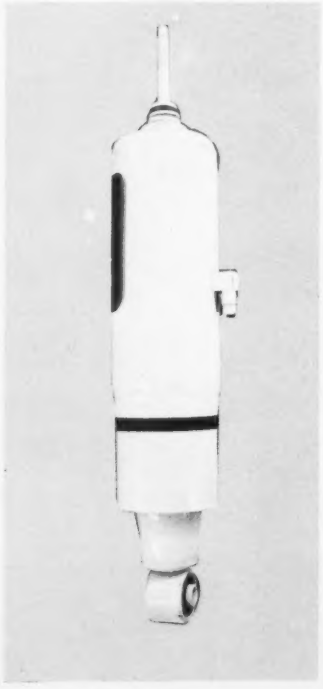
While a set of standard heavy-duty shocks should be all that's required for normal driving, if you carry heavy loads or do a lot of towing you probably should get into a bit more shock. The most popular extra-heavy-duty shock is the overload type, which is simply a standard heavy duty shock with a helper spring added for extra loads (see photo).

Special adjustable shocks, especially air adjustable units, and high-performance gas pressure models are also becoming quite popular for extra-heavy service and high-performance driving. These shocks are great for their designed purposes. But be sure you need what they offer before laying out the extra bread. A reputable shop should provide guidance as to whether you need these specialized shocks and



This original-equipment shock lasted only 15,000 miles. Standard shocks should be replaced with heavy-duty models (right) —even for average driving. Along with being guaranteed for the life of the car, heavy-duty replacement shocks provide a better ride, better handling, better tire mileage, and they help compensate for worn suspensions.





For hauling loads, towing, or hard driving, special-duty shocks are needed. The standard overload shock (left) is the most popular extra-heavy-duty shock. Adjustable shocks (center) can be adjusted from light to extra-firm damping to accommodate the driving and load conditions. Air adjustable units (right) are the latest thing in high-performance shocks.

what types are best for your vehicle.

INSTALLATION

If you're "backyarding" your new shocks, all you'll need is a good level surface, a set of jack stands, and a couple of wrenches. It's a good idea to squirt a few shots of penetrating solvent on the shock mounting bolts a few days before you plan to work, just to be sure the old shocks don't give you any trouble coming out. However, on older cars the shocks mounts may be badly corroded. If they are, your best bet is to take the car into a shop were they have the equipment to deal with this problem.

After making sure you have the correct replacement shocks for your car, the first step is to take a few seconds to see how the shocks are mounted. Essentially all shocks bolt on at the top and bottom. To replace the shocks you simply remove the bolts. However, some shocks pull out from the top and others drop out at the bottom. Be sure you know which way they come out and what bolts must be removed. If the shocks drop out at the bottom be sure you can

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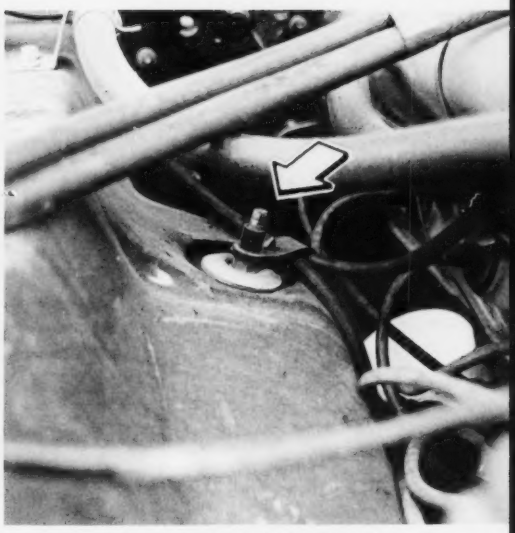


Some front shocks fit inside the coil spring and screw in at the top. If the threads are corroded, the shocks can be tricky to remove; but a pair of vice grips should handle the job. Some shocks drop out at the bottom. Other front shocks bolt on the fender (arrow) and are pulled out from the top after raising the hood .

A shot of penetrating solvent on the shock mounting bolts a few days before you plan to remove the shocks makes the job easier.

Fluid on the outside of the shock is a sure indication of needed replacement.

Take a good look under the car when you're installing the shocks. Checking the brake lines for cracks or damage should be top priority.

Before installing the new shocks, pump them by hand a few times to build up fluid pressure. This way the shocks will have correct damping immediately.

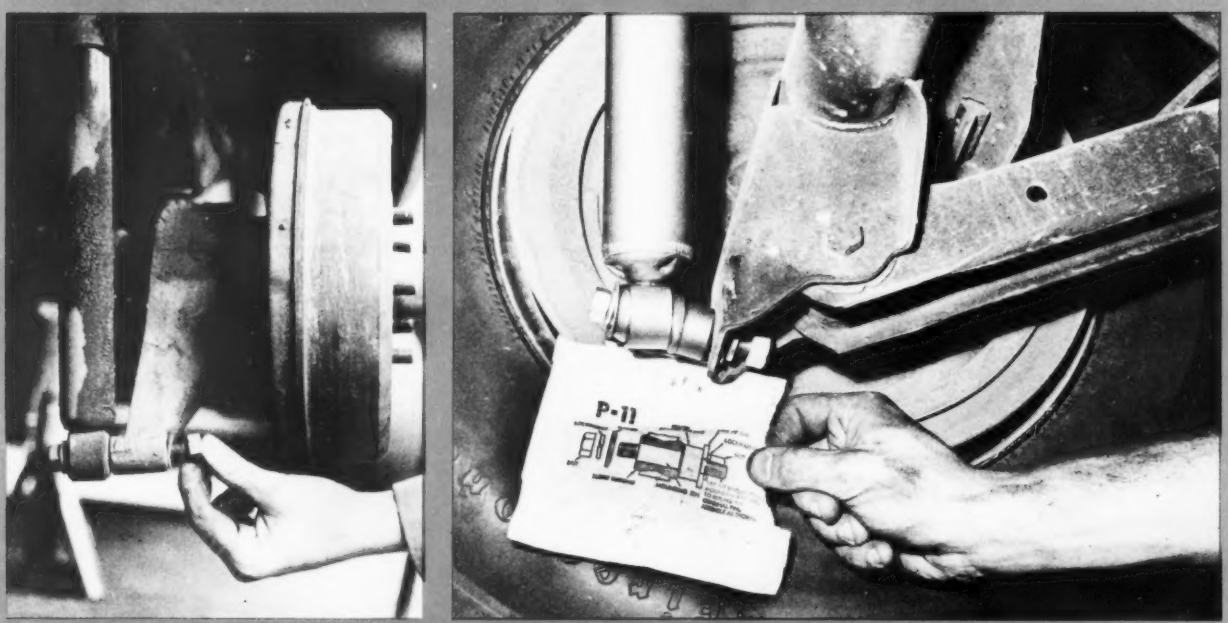
raise the car high enough to get them out. If not you may have to use a lift.*

When you've determined how the shocks come out, you're all set. Jack up the front or rear (whichever you're working on) of the car and place it carefully on safety stands. Chock the wheels to prevent any movement. In most cases you won't need to crawl under the vehicle to remove the shocks. However, it's usually best to remove the wheels to give yourself more room to work. If you go this route, remember to loosen the lug nuts before raising the vehicle so you can remove the wheels without a hassle.

When removing the shocks, be sure to lay out the removed spacers, washers and nuts just as they came off to make sure you get the replacement shock on properly. Most new shocks come with a diagram showing how the shocks fit (see photo) so you should have zero problems installing them. The only possible hassle you could have is with front shocks that mount inside the coil springs. However, with most newer cars the top of the front shocks bolt to the fender, and the bolts are reached by simply raising the hood.

When you get the new shocks installed and the bolts properly tightened, you're ready to go out and discover the "shocking difference." Enjoy it.

** On older cars equipped with rear coil springs the car should be left on the ground to remove the shocks. Removing the shock with the wheels raised can cause the axle to drop.*



Shock replacement is simply a matter of removing the mounting bolts at the top and bottom to remove the shock, then bolting on the new shock. Make sure all spacers, washers, and nuts go back on correctly. A diagram may be provided with the new shocks to help you keep things in order.

PET PEEVE

My pet peeve concerns the guy who just has to pass one more car and so takes up the distance you are trying to maintain between the guy ahead of you and yourself, causing you *both* to end up tailgating!

Thanks to:

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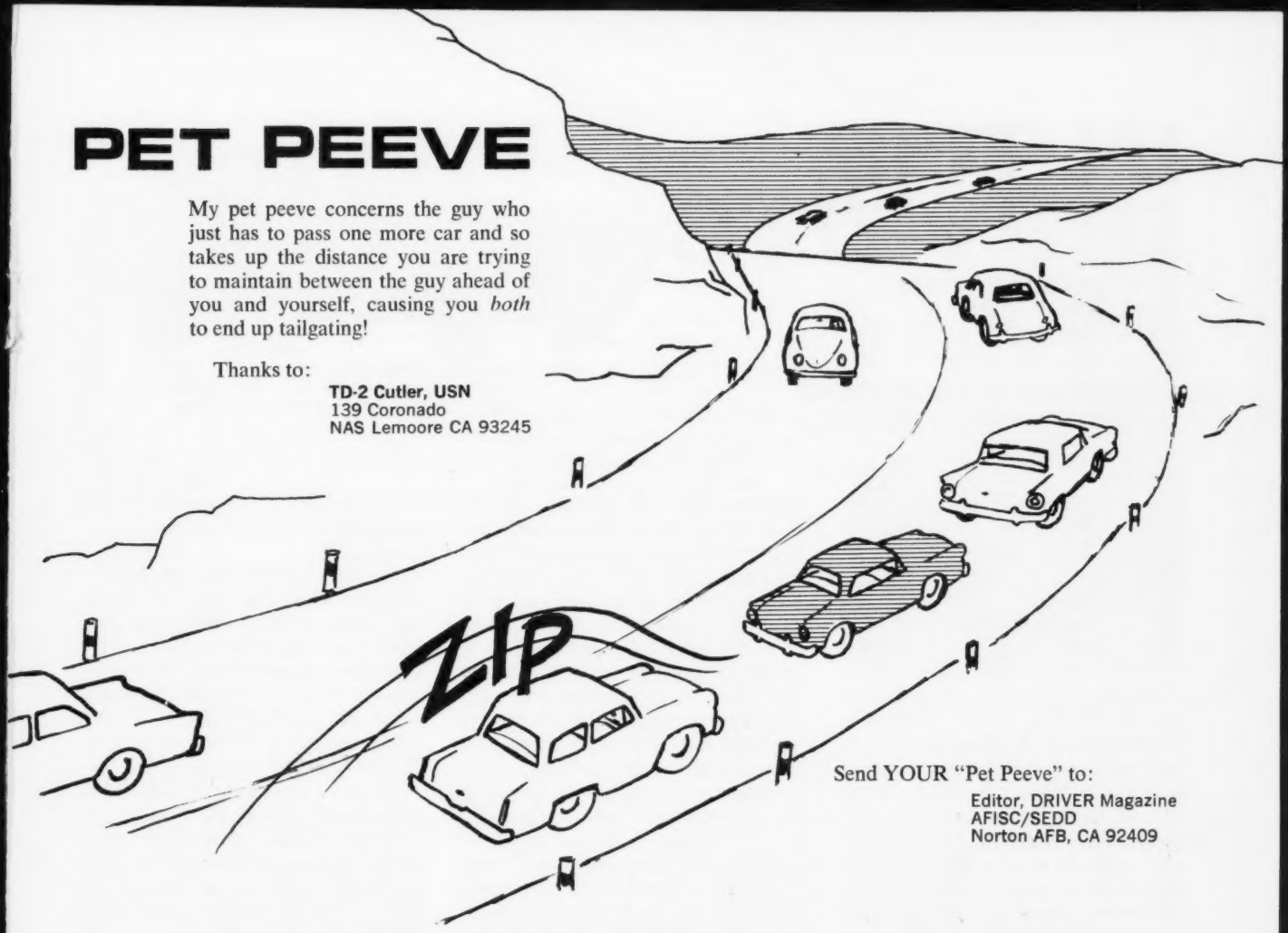
NAS Lemoore CA 93245



Send YOUR "Pet Peeve" to:

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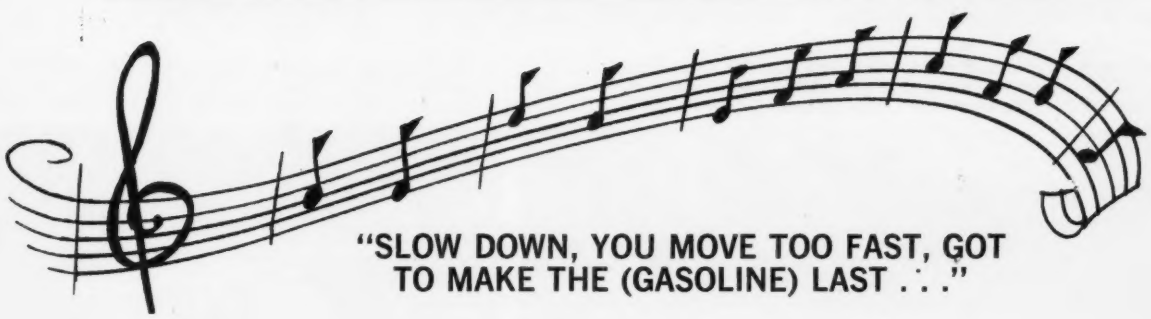

"SLOW DOWN, YOU MOVE TOO FAST, GOT TO MAKE THE (GASOLINE) LAST . . ."

These words of a Paul Simon song have special meaning now, especially with the liberty we've taken in applying the phrasing to government efforts to conserve fuel. Along these lines, the President has directed that governemnt vehicle speeds be limited to 50 mph. Each service has its own way of implementing the new limit. Here are some important points in the Air Force plan.

— Government vehicles operated by Air Force people should be operated at minimum safe speeds (within posted speed limits) commensurate with mission needs and within the 50 mph maximum limit.

— Excluded from this restriction are emergency vehicles operating in response to emergency situations when higher speeds are essential.

— Air Force people are encouraged to utilize the 50 mph limitation in operating their personal motor vehicles.

IN THE DRIVER'S SEAT

Mike Waskowich displays one of the many first place trophies he has won on the tough open competition trail of the Taipei Area Sports Car Club.

MIKE WASKOWICH

Last year was a banner year for the Taipei Area Sports Car Club and in particular Mike Waskowich. Waskowich, a Technical Sergeant with the USAFSS at Shu Lin You AS, drove his underrated 1972 Datsun 1200 to eight overall victories in thirteen SOLO II-type races sanctioned by the TASCC. He took second in four other races. Consistency is the name of the game for Waskowich as he placed high enough in each heat to accumulate enough points to capture the victories in tough open competition. His little Datsun faced stiff odds all season from powerful Datsun 240Zs, Volvos, Alfas, MGs, Triumphs, and even hefty American cars.

The TASCC sanctions SOLO II races on a hard-packed clay surface just west of Taipei. Beautiful engraved trophies entice an average field of over 10 cars to vie for the checkered flag. Waskowich, who also serves as president of the club, took first place honors in the First Annual "Firecracker" Sports Car Show that was viewed by over 4000 spectators. Show entries totaled just under 20 cars as fans voted for the winning entry. His expertly prepared and detailed entry garnered over 200 votes more than second place. Waskowich spent two weeks preparing his car for the event. His show and go machine is awaiting this year's racing season that will prove to be the best year for the Taipei Area Sports Car Club's young three-year history. The club boasts an active membership of 20 military and civilian personnel from the greater Taipei area. A fine organization when one considers the American sports car population is a minority on the small Pacific island of Taiwan.

Ed Note: DRIVER has always been your magazine. But you, the reader, can make it even more your mag. Here's how. There's a lot going on out there that we don't know about—but you do. So we're doing this thing called "In the DRIVER's Seat." Its purpose—for you to let us and everyone else, know what's happening.

If you've done something unique in the way of autosports, safety, or in any area of interest to DRIVER readers, or know someone who has, let us know. We'd like to put one of you "in the DRIVER's seat" every month. Send your nominations for "In the DRIVER's Seat" to Editor, DRIVER Magazine, AFISC/SEDD, Norton AFB CA 92409.

Powersliding hard into turn eight, MIKE WASKOWICH piloted his Datsun 1200 coupe to eight OPEN COMPETITION victories during the 1973 racing season in Taipei, Taiwan.

Pushing the coupe to it's max, MIKE WASKOWICH posts another victory in TASCC race action. The dusty course is the scene of monthly action in Taipei, Taiwan.

Answer to

"WHAT SHOULD YOU DO?"

(See back cover before reading)

The correct answer is A. Brake hard, but don't lock the wheels. Every mile you take off your speed reduces the impact force. Head for the right shoulder and give him the entire road. If there's time, lean on the horn and flash your lights. If he continues toward you, take the ditch or any open ground to the right free of solid obstructions. Remember that any alternative, even a roll-over, gives you a better chance than a head-on collision.

Whatever you do, don't try to outguess him and swerve to the left around him. He may recover at the last instant and instinctively veer back into his own lane—to hit you head on.

(Arizona Safety Sadistics)

AFTER DARK

Reduced speed limits almost surely means we're going to be doing more night driving—it will take longer to cover the same distances. Two things make night driving hazardous. First, and most obvious, your ability to see is greatly reduced. And second, other drivers present more risks to you because more of them are tired, impatient or have been drinking.

Here are some things to do to increase your security on the road at night:

- Keep your eyes moving. It is easier to distinguish dimly lighted objects if you don't stare directly at them.
- Increase your following distance. It's almost impossible to judge how fast the vehicle ahead of you is moving just by watching the taillights.
- Wear sunglasses during the day —especially around the beach or in snow country—but *take them off* at sunset.
- Stay relaxed. If that on-coming driver refuses to lower his high beams after you've flicked your lights, resist the temptation to get even by putting your own high beams on. Deal with the glare by reducing speed and guide yourself by glancing at the right edge of the road, the divider strip, or even the oil-drip path down the center of the lane.
- Dim your instrument lights so that your eyes aren't reacting to the brightness.
- Remember that your headlights light up far less of the roadway when you are in a turn or curve.
- Don't push yourself. Take frequent food or rest breaks.

ABOUT MISS DRIVER

Eighteen-year-old "Missi" Brown comes from Springfield, Missouri. She starts college next term, and plans to become more deeply involved with her interests in witchcraft, drama, art, and music. She loves to travel, and says she is not the homemaker type. Missi told us she is bugged by drivers whose cars have burned-out taillights. She says it's something you see all too often, and is especially dangerous on country roads.

BUDDY DRIVERS

One of DRIVER's hardest jobs is to talk about alcohol. After all, people do drink. If the state says they're old enough, it's perfectly legal. People also drink and drive. That's not legal, but we all know that lots of people do it and frequently they get away with it. For a while anyway.

Nevertheless, alcohol is the most serious traffic problem we have. So when somebody comes along with a really sensible idea to keep drinking drivers off the road, we are eager to pass it along.

The beauty of this idea is that you DRIVER readers can pick it up and make it work without much strain. It's called "The Buddy Driver System" and it's working now at Scott AFB.

What you do is get a few concerned people to volunteer to be identified as Buddy Drivers. Get their names and phone numbers together on a list to be kept at a central location such as the duty forecaster's office. When somebody in the organization has been partying, has had too much to drink and has a car to drive home, he or she calls (or has someone else call) and asks for a Buddy Driver.

The main thing is to keep the intoxicated person from behind the wheel. No records are kept, no reports made, no questions asked. Everybody in the organization has to understand that he can call for a Buddy Driver without fear of prejudice. In fact, it will be a point in his or her favor that good judgment was shown.

If you would like to try this idea, ask someone in the Base Safety Office to help you publicize it. At Scott they made up some wallet-size cards with the necessary phone numbers and a few lines emphasizing the unofficial, no-strings-attached aspects of the program.

DRIVER thanks Major Barry J. Granlund, Air Weather Service (MAC) for sharing this idea with us.

LETTERS TO THE EDITOR

BACKFIRE

Address your letters to:
Editor
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MOTORCYCLIST'S IMAGE

I was very happy to read "The Motorcyclist" in your October issue and find that someone had something good to say about cycle riders. Commander Johnson did an outstanding job in writing that article!

Motorcycling is a legitimate means of transportation, and I'd like to see the image of the motorcyclist changed to a respectable one. I ride a Kawasaki 903 (dresser) and still have a hard time with automobile drivers who all seem out to get the rider, one way or another. It really would be a shock to have someone yield to me, instead of trying to run me off the road.

Again, my compliments to LCDR L. A. Johnson.

SSgt Mark G. Whidden, USAF
Dover AFB, Delaware

Thanks, Mark. We're pleased by the great response to this article, and by the comments from auto drivers who are looking at cycle riders in a new light. The fuel shortage may result in an increasing number of driver-riders who will learn to appreciate a rider's perspective firsthand.

WINTER DRIVING TIPS

Your November article about winter driving was very good and I think it will aid many drivers.

I've had a lot of experience driving in the snow belt of our nation and have some hints I hope will be helpful to fellow drivers.

First, when driving on any form of snow, I have found it is better to brake with a pumping action rather than applying a steady brake. Pumping helps prevent the snow-plow action which results in a skid.

Secondly, when driving on fresh snow, it's best not to follow in someone else's tracks. The snow in the tracks is usually packed hard and has the same effect as driving on ice. So, by driving on the fresh snow, you will have better control over your car. Happy driving!

PFC Ronald E. Fugiel
USACC Sig Det (AD) 6 Rgn
Fort Baker, CA 94965

LOOK TO THE REAR!

As a member of the Army who also earns part of his living by driving an ambulance, I would like to mention what I consider to be one of the more serious problems of today's driver. It's the failure to use the rearview mirror properly and yield right-of-way to emergency vehicles.

Especially at night,drivers often are unaware that there is a vehicle behind, even with four rotating beacons and a flashing, high-intensity mars light. To be a really aware driver you've got to scan instruments, mirrors, and the road every few seconds. Yet many drivers seem unaware they even have a rearview mirror!

I have a definite reason for having the lights on and "requesting" the right-of-way. Please check behind you once in a while so that we can get a patient to the hospital alive.

DRIVER is a very worthwhile publication, and I feel that you are doing a great service to all readers. Keep up the good work!

SSgt E. B. Henry
Military Dept
Colorado School of Mines
Golden CO 80401

You couldn't be more right about the average driver's attitude toward the rearview mirror. Every driver training program we know of stresses constant movement of the eyes and scanning of the mirrors, but tests show that many drivers simply focus straight ahead.

GAS CAN HAZARD

Carrying a can of fuel within a vehicle is acknowledged by safety experts as an extreme hazard. Yet in your November '73 article on four-wheel-drive vehicles you list a can of gas as a basic emergency item to carry in the vehicle. Perhaps certain emergency situations require fuel to be transported in such containers, but I think it is a gross error to include fuel cans in a list of essential emergency items.

Readers should also know that shovels, chains, axes, etc, could become deadly projectiles in the event of a collision or upset. As a result, they should be carefully packed and anchored in place.

Sgt James F. Campbell
Det 2, 5th Weather Wing
Seymour Johnson AFB, NC 27530

You're right, it is hazardous to carry a container of fuel within a vehicle because of fire danger in the event of collision. The November article was written primarily with off-roading in mind where collision is unlikely. Nevertheless, the best bet is NOT to carry spare gas UNLESS you are taking it to someone who is stranded. Thanks for pointing out the discrepancy, and for the good point about tying down cargo.

SPECIFIC GRAVITY GOOF

Your article on "The Battery" (Nov '73) was interesting and well-written, which was no surprise since it seems your excellent mag accepts nothing less. But I had a little trouble with your explanation of specific gravity (footnote, p. 19). Did you mean to add something about equal volume or displacement?

Mr. Bruce McDonald
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We decided a simple, yet reasonably accurate definition of specific gravity would be, "the weight of a substance compared to the weight of an equal volume of water." But it didn't come out that way. The essential words "of an equal volume of water" were dropped during production and we didn't catch the omission. Sorry, readers.

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TUNE UP

You'll never see me Hydroplane
Matilda, you'd better explain
I prefer, Boris dear, for the weather to clear
Before I go out in the rain
DING DONG
KELLHER

WHAT SHOULD YOU DO?

Suddenly your blood chills! Another car is speeding toward you in your lane—a head-on crash looms! Is he drunk, asleep, ill, inattentive? No matter. You'll need to keep all your wits about you to avoid the worst of all highway accidents. What should you do?

A. Brake hard, lean on the horn and flash your lights. If he continues toward you, take to the ditch or any open ground to the right if free of solid obstructions.

B. Swerve to the left around him.

(See answer page 27)